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Journal of the Society of Arts.

FRIDAY, MARCH 2, 1855.

INTERNATIONAL COMMERCIAL LAW.

The Council, at the request of the Special Meeting held on the 2nd of February, has appointed a Committee to consider the best means to be adopted to further the object of the proposed Congress at Paris, for the Promotion of the Assimilation of the Commercial Laws of the Great Nations of the World; and it was resolved that the following gentlemen be requested to serve on it:—The Right Hon. Lord Brougham and Vaux, Messrs. Wm. Bird, Elihu Burritt, Edwin Chadwick, C.B., R. P. Collier, M.P., Q.C., Warren De la Rue, F.R.S., John Dillon, Viscount Ebrington, M.P., Messrs. Wm. Ewart, M.P., J. P. Gassiot, F.R.S., T. Milner Gibson, M.P., J. W. Gilbert, F.R.S., G. A. Hamilton, M.P., the Right Hon. the Earl of Harrowby, Messrs. Wm. Hawes, T. E. Headlam, M.P., Q.C., Henry Thomas Hope, John Howell, T. B. Horsfall, M.P., William Hutt, M.P., Leone Levi, F.S.A., F.S.S., Benjamin Oliveira, M.P., Lieut. Col. Sykes, F.R.S., John Ingram Travers, Dr. Waddilove, and Thomas Winkworth.

And it was further resolved that the foregoing Committee be authorised to appoint a deputation to wait upon the President of the Board of Trade, if such a course shall be deemed advisable.

TWELFTH ORDINARY MEETING.

WEDNESDAY, FEBRUARY 28, 1855.

The Twelfth Ordinary Meeting of the One Hundred and First Session, was held on Wednesday evening, the 28th of February, the Right Honourable Earl Granville, Vice-President, in the Chair.

The following Candidates were balloted for and duly elected Ordinary Members:—

Brodie, Joseph.	Rammell, Thomas Webster, F.G.S.
Costar, Francis Wright.	Rawlinson, Robert.
Hammond, Wm. Frederic.	Warren, John Neville.

The Paper read was

ON THE IRON INDUSTRY OF THE UNITED STATES.

By PROFESSOR JOHN WILSON, F.R.S.E.

The paper which I have been invited to read before this Society fortunately needs but few words from me by way of introduction. Its title, "The Iron Industry of the United States," secures for it a twofold consideration here. The one, natural to every country whose power has been increased and whose wealth and general prosperity have been advanced by the development of its ironmaking resources; the other, natural to this country, whose relations, both social and industrial, are so identi-

fied with those of the United States, as ever to excite a lively interest in all the questions which affect their commercial prosperity; and few questions can exert a more mighty influence on the destinies of a country than the possession of the two minerals—iron and coal—the backbones of industry, and the basis of all commercial prosperity.

It is unnecessary to occupy your time with more than a brief sketch of the past history of the iron industry of the States. It contains the usual fluctuations attendant upon the establishment of a new industry, with periods of prosperity and of adversity, induced by fiscal as well as commercial agencies. Iron appears to have been first made in Virginia about the year 1715, previous to which the colony was supplied from the mother country, and, shortly after, the manufacture was established in the States of Maryland and Pennsylvania. In 1738, we have the evidence of some progress having been made, in the shape of a Report from the officers of the dockyard at Woolwich to the Navy Board, dated September 3:—

"We have lately received from his Majesty's yard at Deptford bar iron flats of 2½ in. broad by ¾ in. thick, 15cwt. Qtr. 24lbs.; squares of ¾ in., 5cwt. Qtr. 12lb., imported by Mrs. Cowley from America; and, pursuant to your warrant of 11th July, 1735, have made sufficient trial of each of the sorts; find the said iron to be very good and fit for H.M. service, superior in every respect to the best Swedes iron, and in our opinion, worth £17 10s. 6d. per ton."

The manufacture progressed but slowly, though the quantity exported exhibits a regular increase, averaging during the 10 years from 1740 to 1750, about 2,360 tons per annum, which was gradually increased for the next 20 years, until in 1770 it reached 7,525 tons, being rather more than one-sixth of the entire quantity of all kinds of iron imported into England at that time. As the country settled down after successfully asserting its independence, and the works of industry were resumed, we find a great advance was made in iron-making. In 1810, the whole number of furnaces in the United States was 153, giving a production of 54,000 tons per annum;—equal to about 16lbs. per head of the population. From 1810 to 1820, but little progress was made, the trade being in a very depressed state. In 1828, the production had reached 130,000 tons, having been rather more than doubled in the 18 years. In 1829, it is given at 142,000 tons, showing an increase in one year of nearly 10 per cent.

In 1830, it was 165,000 tons, exhibiting an increase of 16 per cent. In 1831 the production was 191,000 tons; and in 1832, it reached 200,000 tons; thus showing an increase of 70,000 tons, or 55 per cent., in the four years since 1828. In 1840, the census returns give the gross production at 286,903 tons; however, according to the report of the committee of the Home League in New York, it was estimated at 347,700 tons. The mean of the two would probably give the safest estimate, this would be 315,000 tons, or an increase equal to upwards of 50 per cent. in the eight years. In 1842, many of the works were closed, and the production fell to about 225,000 tons. In 1846, the trade was in a prosperous state again, the gross production for that year being estimated by the secretary of the Treasury at 768,000 tons,—having thus been trebled in 4 years; and in the following year it is supposed to have reached its maximum amount, not less than 800,000 tons being the furnace returns for that year. Circumstances, commercial as well as fiscal, appear then to have exerted a depressing influence upon the trade, and to have checked its career, as in 1848 a downward tendency is shown, which caused a decrease of about 150,000 tons in the following year's make, and another reduction of 100,000 tons at least in that of 1850. The production for that year, according to the census returns, is given at 540,000 tons; this is, probably, too high an estimate, as we find from the Report of the Statistical Committee of the Ironmasters Convention, that the entire make in the state of Pennsylvania for that year was

198,813 tons, whereas the census returns give it at 285,703 tons, a difference in excess of 86,890 tons in one State only. In the following year, trade again reviving, a regular increased production has taken place, and the returns for the past year (1853-4), present the satisfactory appearance of a make equalling the maximum which the trade had reached previous to the depression.

The iron-making resources of the United States are very great—the distribution of ores, many of the richest description, is general throughout the Atlantic and Western States; while the enormous area occupied by the coal measures, testifies to the abundance of fuel for the development of industrial applications.* The ores comprise every variety found in Europe—those principally used for smelting are the magnetic oxides, the hematites, and the clay carbonates of the coal veins. Besides these, the “spathic or sparry carbonate” and the “oligist or specular ore” are used in some of the New England States, but only to a limited extent. Quite recently a discovery has been made of rich seams of black band, in connexion with the bituminous deposits of the great Eastern Coal field, which will probably hasten the development of this industry in that favoured region. The magnetic oxides and the hematites are dispersed pretty generally throughout the whole extent of the Union, from Maine to Texas, and from the Atlantic seaboard to the states of the far west. The clay carbonates are associated with the coal measures lying west of the Alleghanies. In general, they are not so rich as those in this country, but when mixed with the hydrated hematites which are met with skirting the coal districts, these ores are profitably worked up. They are also found in considerable deposits on the Atlantic side of the mountain chain in Pennsylvania, Maryland, Virginia, and North Carolina. The spathic ores are found chiefly in Connecticut and Vermont, and where they are worked in the old way, with charcoal and the cold blast, furnish iron of first-rate quality. The specular iron ores occur in the New England States, and in New York State to a comparatively limited extent:—in the more distant States, both of the south and west—Texas, Arkansas, Missouri, Iowa, and California, they are reported to exist in great abundance. The industry was first established in the New England States, where the ores and the fuel (wood) were in great abundance, and where the education, habits, and energies of the people were well adapted to the prosecution of new industrial pursuits. The existence of coal in the State of Pennsylvania soon, however, raised a formidable rival, and from the year 1820, when mineral fuel was first worked and sent to market, the production of iron in that state increased so rapidly as to cause it to become the great centre of the industry, and to give it the entire control of the home market. This position it still holds, and must do so for some years to come, until the still greater resources of the states west of the Alleghanies are sufficiently developed to contest the lead with their more advanced neighbour. These possess natural advantages superior for iron-making purposes to those of Pennsylvania. Associated with the coal measures, beds of iron ores, and also of limestone, are met with generally throughout their vast area—whereas, in Pennsylvania, the ores and the fuel have to be sought for in different localities. Thus, while the smelting furnace within the one district finds a ready supply of both ores and fuel immediately at hand, the location of the other has to be determined by calculations based upon the comparative cost of transport to the furnace of the necessary ingredients—the fuel and the ores. In my recent inquiry into the iron industry of the Union, I was led to a divisional arrangement, as best adapted for showing the chief seats of the industry, with their respective advantages and capabilities. These I will briefly give now, with their production in the last year (1853-4), and the estimated cost of manufacture:—

1. The Houseatonic district—Production, 10,000 tons; cost per ton, 20 dols. to 25 dols.
2. The Hudson River district—Production, 80,000 tons; cost per ton, 18 dols. to 20 dols.
3. The Delaware and Lehigh Rivers district—Production, 120,000 tons; cost per ton, 16 dols. to 18 dols.
4. The Schuylkill River district—Production, 100,000 tons; cost per ton, 20 dols.
5. The Susquehanna River district—Production, 120,000 tons; cost per ton, 15 dols. to 18 dols.
6. The Potomac River district—Production, 125,000 tons; cost per ton, 20 dols.
7. The Ohio, Cumberland, and Tennessee Rivers district—Production, 150,000 tons; cost per ton, 20 dols.

Besides these well-defined districts we must allow about 100,000 tons as the production of the numerous isolated works scattered throughout the upper portions, especially of the Atlantic States, where charcoal as fuel is universally used. In these iron of the best quality is made, but at a cost of nearly double that of the coal furnaces.

The present consumption of iron in the United States may be taken at 1,200,000 tons, which approximates very closely to the estimate mentioned by Mr. Scrivenor, as given by Mr. Wern, of Sweden, viz., 88 lbs. per head of the population. To meet this the home production is not at present equal; about half the present make is consumed for castings, and the remaining portion is converted into wrought iron, at a loss in waste, &c., of about one-third. This practically reduces the total or available production to 700,000, leaving a deficiency of 500,000 tons to be supplied by other countries. Hitherto the demand has increased in a ratio far beyond the ratio of production, but as the capability of production is, in this case, entirely a commercial question, the interests of the supplying countries are affected equally with those of the consuming country, by all circumstances, whether fiscal or industrial, which are brought to bear upon it.

	1840. Tons.	1850. Tons.	1852. Tons.
Make of iron	286,903	564,755	500,000
Quantity imported.....	80,886	441,514	501,158

This large importation to meet the home consumption is obtained entirely from this country, and forms a very important item in the commercial intercourse of the two countries. The value of the United States market to our iron manufacture, may be readily seen in the Board of Trade returns, which give the exports for the years 1851 and 1852 respectively:—

	1851. Tons.	1852. Tons.
To the United States	464,559	501,158
To other countries	295,211	393,266

Thus giving an excess of about one-third in favour of the United States over the gross exports to other countries.

To retain this good customer, of course is very desirable, and from what I was enabled to glean of their resources, and what I know of our own, I am strongly of opinion that this may be done for many years to come; but the time and the quantity will depend materially upon our “economy of production.” At the present time, when the consumption doubles the home manufacture, the markets of the Atlantic States are virtually ruled by the prices of iron in this, the supplying country. As long as the price of English iron prevents its importation into the Union under 20 dols. for pigs, and English bar-iron under 50 dols. per ton, the home manufacture can compete profitably with it in their markets, and the iron industry of the States will flourish and increase. Any fall in the English iron that would bring down its price in the American markets lower than the sum quoted would immediately check their home production, and again throw them upon our markets for their supplies. The difference in

* Professor Wilson here pointed out on a large map, which had been kindly lent for the purpose, by Mr. Stanford, of Charing-cross, the districts occupied by the coal measures, and explained generally the characteristics of each.

price between the two markets may be taken at 80 per cent. This includes all charges for freight, commission, insurance, &c., about 50 per cent., and the *ad valorem* import duty of 30 per cent. In round numbers, pig iron selling at Liverpool at 45s. to 50s. will cost 20s. at New York. Thus the ironmasters of the States possess a *natural protection* of 50 per cent., which will always remain, and an *artificial* one of 30 per cent., which, like all fiscal charges, is liable to be changed.

The fiscal charges have undergone several changes, each gradually reducing the state protection, and leading the industry to the more healthy condition of reliance upon its own vast resources. In 1815 the duty on imported pigs was fixed at 1.50 dols. per cwt. In 1818 it was reduced to 50c. per cwt. In 1823 it was slightly raised, being 62½c. per cwt. In 1830 it was again fixed at 50c. per cwt., and in 1842 it was reduced to 9 dols. per ton. In 1846 the present *ad valorem* duty of 30 per cent. was established. These several changes have had their effect upon the development of the home manufacture, but the great variations seen in the annual production may be traced to other causes, of which the rise and fall in our markets appear to be the most important.

The iron industry of the United States is at present only in its infancy, an off-spring quite of the present century. Its growth has been somewhat irregular, it is true, but when we find that it has already reached the gross amount made in this country only 20 years ago, and when we recollect the vast mineral resources of the United States, the rapid increase of population, with its increasing demands, and its unquestionable energies and power of application, it forces upon our minds the conviction that the time is not far distant when it will not only furnish sufficient for its own consumption, but be in a position to compete with us in the other importing markets of the world. In the different districts I visited, I found every advantage taken of our experience in the construction and working of their establishments. Everywhere the charcoal forge was giving way to the superior advantages of the hot-blast anthracite furnace. *Economy of production* was the main object of the manufacture, the quality of their ores and fuel always guaranteeing a good article. The use of the waste gases of the furnace was universal in their establishments; the difference of opinion as to their value, so startling in this country, did not appear to exist there. Attempts were being made also to utilise another waste, and, at the same time, cumbersome product—the slag or cinder. This, by a process of annealing, is susceptible of conversion into a hard and durable material, which, moulded into shapes, is adapted for various purposes of construction, or, with the additional labour bestowed upon it in polishing, is suitable for ornamental applications. Some specimens which I had an opportunity of seeing in the States were apparently homogeneous in their composition, and perfectly vitrified. Those now on the table were obtained by the same process, from the Dowlais furnaces. If this process can be brought into successful operation on a large scale, it will be the means of affording us a very useful and desirable material at a low cost, while at the same time it will help to consume a waste product, which at present is an expense to the ironmaster to remove. Another process, too, which I saw in operation in the States, appears to me worthy of consideration here—that of making wrought iron *direct* from the ore. This has long been a desideratum in all iron-producing countries; many attempts have been made, but none, I believe, have been so successful as to induce an operation on a large scale.

The process I refer to was patented by Renton, in 1851, and was in operation at Cincinnati, and at Newark, New Jersey. The description and particulars of working I have given at length in my report to H.M. Government. Another operation of some magnitude for a similar purpose, and based on a similar principle (Harvey's patent), is carried on at Motthaven, New York, where the returns, I am informed, are equally satisfactory. In both the conversion is effected by mixing the ores with

a proportion of fuel, both being reduced to a coarse powder, and raising the temperature by means of heat applied externally to the chamber in which the mixture is contained. The fuel is ignited, and burns at the expense of the oxygen of the ore, and metallic iron is left mixed with the foreign substances usually accompanying such minerals. This reduced ore descends through a shoot to a furnace, suitably arranged, and subjected to a temperature sufficient to bring the iron to a pasty condition, when it is worked together as in a puddling furnace, and drawn out in balls of the required size for tilting. By this process a great saving is effected, as the entire expenditure of exertion, fuel, and labour, would not much exceed that of the ordinary process of puddling—while at the same time a superior quality may be expected, as the temperature at which the deoxidizing action is carried on is not high enough to cause the iron to combine either with the carbon of the fuel or with any of the other impurities, as silicon, sulphur, phosphorus, &c., which are always found in the ordinary pig iron. The first (Renton's) I am informed will shortly be in operation at the Llynvi Valley Works, South Wales. The sectional diagrams of the furnaces used show their management, and on the table are specimens of the manufacture of both the processes—and also of the principal ores used in the manufacture of iron in the States. The great abundance of the magnetic oxide, the richest of all iron ores, and its proximity in many localities to the coast, I am inclined to think, places it quite within the reach of our ironmasters who may require additional material, either for increasing the quantity or for improving the quality of their produce. In conclusion, I would venture to specify as my claims to the attention of the meeting, the consideration of the following points:—

1. The make and the consumption of iron in the United States.
2. The deficiency is supplied from Great Britain, and the relative value of the United States trade to this country.
3. The relative price in the two markets—the natural and artificial protection of the United States.
4. The enormous mineral resources of the United States.
5. The desire for economising the cost of manufacture.

DISCUSSION.

Mr. T. M. GLADSTONE said, having listened attentively to the excellent paper of Professor Wilson, he had not only felt much interested in his clear and elaborate observations on this subject, but had gathered some instruction therefrom. At the same time, he must beg to differ from Mr. Wilson's reasons and conclusions on several points, to which he would draw the attention of the meeting. In the first place, however, he would wish to rebut the charge that gentleman had made as to the backwardness of British ironmasters, objecting to any experiments or to resist advance in any improvement offered to their acceptance. It was true that they hesitated to proceed with experiments merely upon the propositions of the theorist, unless from their own experience they saw a reasonable probability for a useful and economical purpose being attained, as interference in the manufacture of iron involved a serious expense and too frequently positive loss of time and money. He would say, however, the ironmasters of this country had always shown themselves willing and ready to promote all methods likely to be beneficial, it being not only a duty but their interest to do so; and perhaps one of the best answers to this allegation was, that the author of the paper informed us the plan shown in the model before the meeting, was about to be tried in South Wales. Of his own knowledge, in Staffordshire opportunities had been given by placing everything at the disposal of the experimentalist, and every personal assistance had been rendered to carry out on a large scale that which had appeared to the theorist and in the laboratory perfectly available and economical. Under these conditions, such experi-

ments had totally failed, evidencing the necessity of caution, and the value of practical knowledge; to determine where and in what way it was safe to proceed, and that the manufacturers were not to be lightly charged with want of energy, or desire for progress in improving their manufactures. There were many reasons operating to prevent the likelihood of any serious competition in a neutral market by the American maker against us, and, even in their own, with a protective duty. It was true that, looking at the vast fields of materials presented in the States, the elements of future and abiding riches were presented, and it seemed that Providence in his mighty wisdom in those things that were needful for the use of man, set forth in abundance all things needful for him; and while a glorious future was before that great country, as her territory was covered by people, so these things would in due time be developed and made available, but it would be a long period from the present. He rejoiced to think that such stores were ready for such universal benefit. Although this was so, and although the progress made in the States had been great, it would not be in this generation we could be so interfered with as to dread any competition, but we should still supply those rising wants to a vast extent. One reason, irrespective of any other, against economic production in America, arose from the climate. Many in that room would recollect the excitement of 1845. At that time a party came from America and took with him numbers of puddlers from Staffordshire. The inducement was payment at 21s. per ton sterling against 11s. then paid for that process. When some of these returned, they found in the year that they could not earn more money than at home, purely from climate. In the summer it was so hot they were compelled to stop working; and in the winter so cold that it caused the machinery and many adjuncts to be so disturbed that at the two extremes of the seasons they could not proceed with their employment. Of the effect of the latter, he was sure any one present engaged in iron-making would confirm what he stated; even during the recent severe weather here, the interruption and consequent loss proved great and embarrassing. He had also known instances of interruption from the heat, though the temperature of this country was much lower than in the States, not to say the months of extremes which prevailed there. The numerous, yet necessary, points which had to be thought of before being able to arrive at a just conclusion with regard to capabilities for meeting the commercial requirements connected with iron-making, clearly presented themselves to his mind, as practically acquainted with every part of the subject through a long personal experience, but which it would be difficult briefly to explain. The idea which Mr. Wilson had thrown out, that the time was likely to come for America to supply us with ores at a rate deliverable here so as to meet the market, was quite out of the question. So long as America freely sent us her cotton and corn, those bulky articles would always keep up freights from that country, so as to preclude the possibility of sending ores, whose value at the furnace ranged from 7s. to 21s. per ton in the extremes of the market; and therefore such was not to be thought of while we had still abundance in and around the works from which to draw our supplies, and need not fear competition from any other quarter. While the practical man here was desirous to know what was doing in the States, and ready to receive instruction from thence and to reciprocate the same, he was sure that the American iron-master would gladly receive and duly consider the observations made upon his progress and his position, in the best possible spirit.

Mr. MACGREGOR rose merely for the purpose of drawing attention to a few points which ought, he thought, to be rendered more prominent than they had been made by the author of the paper. In describing the present state of the iron trade with America, he had alluded to the natural protection enjoyed by the American ironmasters

in reference to the competition of this country, and he had estimated that advantage at 50 per cent., but he had not dwelt sufficiently on the fact, that the American manufacture of iron had all along been further stimulated, and that it was now sustained by an artificial system of protective duties. This additional protection appeared to be 30 per cent., but it was really much more, for it was levied not only [on the original cost of the iron, but also upon the charges. It thus appeared that, notwithstanding all the resources which had been exhibited by Professor Wilson, the American ironmaster at present demanded and obtained protection exceeding 80 per cent., thereby nearly doubling the price of iron throughout the United States. A part of this increase of price must, indeed, continue, until they could produce iron as cheaply as it was produced in Great Britain. Looking to the future, Mr. Wilson contemplated so great a development of the iron manufacture, that America might, at no very remote period, not only supply her own wants, but also become an exporter of iron to other countries. In the first place, America had, in order to exclude British iron from her markets by fair competition, to surrender the artificial protection of 30 per cent. Then, as the iron districts of America were at a great distance from the seaboard, they had to convey the iron manufactured there to the populous Atlantic cities and states at an expense which would equal, if not exceed, the expense of conveying iron from Wales and Scotland by water to the same markets. The freight constituted the major part of that expense, and, though it had latterly been considerable, the increased charge had been occasioned by causes of a temporary nature, and it might hereafter be as low as it had been in times past. Assuming that the American people would not always tax themselves by a protective duty in favour of a few ironmasters, under the delusion that it was a national advantage thus to enhance the price of the most precious of all metals, and that the present cost of freight would gradually be reduced to its former level, those who were interested in iron property in this country had no reason to apprehend injurious competition on the part of America. On the contrary, they might expect, with greater freedom of intercourse, equal competition, and no favour, to have an enlarged demand for their iron.

Mr. BIRD, after complimenting Professor Wilson on his most excellent paper, said, there were so many practical gentlemen present, that he was surprised none of them had got up to state their own opinions as to the working of these model furnaces in America. It appeared to him that the production from these furnaces would be about 30 cwt. in 24 hours—

Professor WILSON—No, 50 cwt.

Mr. BIRD—And that the puddling furnaces would be required to be fed. He could not say what was the consumption of the present furnaces. When they considered that the production of iron in this country had reached the enormous amount of 3,000,000 tons of pig iron, and that it had been three years ago produced at a cost not exceeding 36s. a ton, he did not see how any great reduction in the present mode of producing it could be effected. When a friend of his at the Great Exhibition produced one of those large pieces of iron ore he said, "What was the use of trying to produce iron of the value of 1s. at a cost of 2s. 6d." He did not think any new process could be more economic on a large scale than the one at present adopted. The commercial point of view in which they were to regard the question was, whether in future Americans would be as large customers as they were at present; or, whether it was likely they would, by being large producers, cease to be customers to this country. He considered, with Mr. Macgregor, that they should not lose America as their customer. That country made 500,000 tons annually, and imported about the same quantity. We made three millions, and exported half. Why was it that this country could sell iron cheaper than America could. It was because here a large capital was invested in the trade, and the Americans had to travel long

distances with their traffic, without being supplied with economic means of transit; on the contrary, in England as regarded the latter, manufactures could be conveyed to their customers, east or west, at a very small cost. They were so situated that they were warehousemen, and that the success that would attend them in the disposal of their manufactures would necessarily be regulated by the cost of their transit. Now, on that subject his friend, Mr. Wilson, had said nothing, but he considered that the cost of transit must be always regarded as one of the largest elements in the cost to the consumer. America was in advance of them with respect to railway mileage, which would be one means of extending her traffic in iron. It was a great fault that works in iron generally preceded the necessary means of its transit. The great object which they had to consider was, how they could best bring their iron as rapidly and as economically to market as possible. There was a large—an immense, iron field in Silesia, but the means of bringing the production to market were uncertain. The Oder was not only full of shoals, but in the winter season was usually frozen for the space of two months, and the Prussian government refused to have it dredged, because they said that by so doing they would destroy the traffic of carrying by carriages and waggons, and ruin thousands of persons employed in it. Now, he was afraid that in this country too, those facilities were not given to the iron trade which were necessary to its increase. They were not afforded by the railways that facility of transport which they ought to have, and when he jotted down some of the expenses which they ought to save, these amounted to a large sum. If they would look to South Wales, the heart of the iron trade, they would see that after they had carried their iron down from Merthyr Tydvil to Cardiff, by a narrow-gauge line, they found that they could not pass them on to the South Wales line, which was a broad-gauge line. They had then to transfer them, at a cost of 2s. or 3s. per ton, from the waggons which brought them down into those which conveyed them to London. Again, when they arrived at London, they had to stop at Bull's-bridge or Camdentown, for, after having a system of railways for twenty years, or rather a want of system, they had still to use horse power in order to bring their goods to the shipping point. He did not know if that arose from carriers being in the direction of the railway companies; that removal of the iron in London cost 4s. or 5s. more per ton. If they had to ship them to the Baltic, they had to pay 3s. 6d. or 4s. more for Sound duties. When they got to Stettin they had to pay about 2s. again, because they were unable at once to go up the Oder. There was, then, from want of proper facilities, imposed on them an absolute cost of 11s. or 12s. per ton. Indeed, he felt convinced that, more than economy of production, was the necessity that the freedom of transit should be reduced to a minimum of cost, and that those difficulties in railway communication should not any longer exist. There was a great extent of railways in America, constructed with a single line of rail; those would soon require a double line, the rails for which they would either make themselves, or procure from England. He hoped that they would pursue the latter course, and he would give them his reasons why he thought they would. If they were to make them themselves, they would require a great amount of ready capital, which they might perhaps obtain when they wanted another line for their 19,000 miles of railway, from the English ironmasters, who would have the pleasure of supplying them for bonds probably.

PROFESSOR WILSON intimated that there were only 13,000 miles of railway in the United States.

MR. BIRD continued to say they were all aware that each country had many resources of its own, but he did think that the Americans, both in regard to their own benefit, and that of international intercourse, stood much more in their own light than in that of others, by throwing fiscal

impediments in the way of the iron trade. The English would make their rails for them, and that would give them an opportunity of bringing their iron stone and their coal, much more into the market than they did at present. They would thus not only obtain a revenue from their railways, but also promote a harmony between the two countries, which he hoped would always continue. The experience of the States of the Zollverein was, that from all articles on which they had reduced the duty, they derived a considerably increased amount of revenue. It was the same with regard to France, and he thought it was natural for them to look for a removal of the duty on iron charged by that country. If the ironmasters could get that favour, it would greatly improve the prospects of the trade, in which there were indeed many phases. Even as it was, he thought they should, for many years, be the best market for iron either in the Old or New world.

DR. PEARCY had listened with great pleasure to the paper by Professor Wilson, and felt thankful to him for the amount of information he had afforded. He would, however, with the permission of the chairman, put a few questions. First, he would like to know the real cost per ton of iron prepared by Renton's process; for, however ingenious any process might be, they had yet to bring it to the sordid test of pounds, shillings, and pence. Another question he wished to have answered was, whether it had in America been found adapted to the reduction of clay ores. With regard to the mode of effecting the reduction of the ores the most suitable was, in his opinion, one long in use in Sweden. A friend of his at Gottenburg had used it for six or seven years with complete success. It was one which combined the principles of the blast and reverberatory furnaces, and, by the formation of carbonic oxide, could either reduce or oxidise the ore. Should any gentleman require the plan of it, he should feel great pleasure in letting him have it. He had, some years since, furnished copies of the plan to several ironmasters, and it had also been published; but it had not, as yet, been adopted in any of our iron districts. There were one or two matters more on which he should be glad to have information. He thought that Prof. Wilson had said that the impurities of the iron, such as phosphorus and sulphur, were derived from the fuel. Now, there was in all clay iron ores a great quantity of phosphorus and likewise of sulphur, so that it was not from the fuel alone that the impurities arose. With regard to the want of a willingness on the part of the iron masters of this country to make experiments, he was not surprised that they hesitated to do so, as it was a serious thing to disturb the operations of their blast furnaces; yet, in spite of all that had been said on that subject, they still stood the first in the trade. Their lead smelting, their tin smelting, and their iron smelting, were better than those of any other country, and the process of copper smelting in use in Swansea was unsurpassed; indeed, the greatest metallurgical improvements which had been lately introduced were the offspring of the enterprise of Englishmen, as the hot blast of Neilson, and the desilvering process of Pattinson.

MR. MAY said he thought that the ironmasters were in some degree open to the imputation of not being alive to the adoption of improvements, in proof of which he adduced the length of time it required to introduce hot blast, now all but universally adopted, and the benefit of which was demonstrated at an early period of the patent. He might add also, in illustration, the slow progress now making in the consumption of the gases from blast-furnaces, by which one firm alone was saving 1000 tons of coal per week. Economy in using the various products of manufacturing, was a main element of progress, and there might be excessive caution on the part of the manufacturers. He would call attention to a want of true economy in the deteriorated quality of rails now made, as compared with those of 13 or 14 years ago, caused, as he believed, in a great measure, by the plan of competition adopted by railway companies, who, after advertising for

tenders, were too apt to accept the lowest offer, without sufficient reference to quality. There was, certainly, no lack of materials for making good rails, to enable this country to compete with the whole world. The discovery of the ore of the oolitic districts was but recent; and still more recently, a very extensive deposit of spathose ore had been opened up.

Mr. R. F. DAVIS said he was sure that every one present would be obliged to the Professor for the lucid paper which he had read to the meeting. He really must be allowed to differ somewhat from the last speaker, in what he had said as to the want of enterprise on the part of the ironmasters. Need he mention the honoured name of Sir John Guest, for instance, who, beginning, as he had himself told him, with a very small capital, had, by diligence, energy, and enterprise alone amassed a very large fortune, and created quite a little town, in a short space of time, where scarce a house formerly stood. Besides him, were not such names as Crawshaw, Bailey, and the Ebbw-vale Company sufficient alone to rescue the ironmasters from the reproach which had been cast upon them. The manager of the Ebbw-vale Company must sell at least a ton of iron a minute every hour he was at the office, and this immense production had been obtained within a very few years. In the days of protection we were told that America would flood this country with corn—we were now told she would flood it with iron; he need not say the corn did not come, as was fancied, and his hearers might be assured the iron was still more distant. Notwithstanding all that had been said, there were good reasons why our ironmasters should not despair of competing with America or any other country. One thing especially should be remembered in considering the question, and that was, the climate. In their own country, our ironmasters were fortunately situated in this particular, free from those extremes of heat and cold which prevented the proper working of the furnaces. The result of a very slight variation from the evenness of temperature had been seen within the last few weeks. Another fortnight of such extraordinary weather, and there would barely have been a furnace at work in all South Wales. In the summer, disastrous results occasionally arose from extreme heat; the men could not stand it; and if such were the case even here, what must it be in America, where the winter was so much colder, and the summer so much hotter, than ours. The poor manufacturer must often have the pleasure of seeing his weekly production become "small by degrees and beautifully less." As to protection, again, he was surprised that our 'cute Yankee cousins should not see that the duty was not imposed so much upon us as upon themselves, and that they should be so hoodwinked for the benefit of a few individuals. The duty in that country amounted to somewhere about £3 per ton, which was not imposed on the 500,000 tons imported merely, but in practice on the 600,000 tons internally produced also, so that the nation paid three millions sterling a year to support Pennsylvania produce. Every labourer in the United States ought to know and see that he was paying 1s. more each time he bought a spade, than he would do if this duty were taken off. He was convinced, that very shortly the Americans would take a proper view of the question, and see not only this—but also that it was desirable for themselves that this country should have an extended market in America, since thereby they would obtain cheaply materials wherewith to improve their mode of transit, and thus become far more efficient manufacturers than they could under the present system. In respect to the question of cheap rails, alluded to by Mr. May, it was the same with that article as with every other; if they purchased them cheap they would have them inferior in quality; railway directors had, unfortunately, of late years, allowed everything to give way to cheapness, and what was the result? Why, that whatever line of rail you travelled on, you were surprised to see large piles of crushed and laminated rails. The

fact was, such rails were not cheap, and it should be pressed at every board that if, instead of seeking cheapness so much, directors would seek quality more, and purchase such rails as were made fourteen years ago, they would find them, in reality, more economical. He most fully concurred in what had been said as to the difficulties of transit for ore and produce in England. He was aware, and many others also, that at this very moment her Majesty's government wanted iron for a certain purpose, but could not have it, because, in order to bring it from Wales, carts were obliged to be employed. Newport, for instance, a town of about 10,000 inhabitants, the centre of the iron trade, had three railways—two of them belonging to one company—each line having stations there, but no two of them joined, even a few weeks back. The company to whom the two lines belonged thought it very grand to have a station at each end of the town, but just lately these had been united. The other line—the Great Western—the great artery, as it ought to be, of South Wales, was nothing but a great nuisance, totally useless as a communication with the mineral lines of Monmouthshire and South Wales, since they were narrow, and it was broad gauge, and iron and coals especially would bear but little transhipment. Our Yankee friends might be deficient in means of conveyance for their ores, but the English also were greatly behindhand in this respect, and he trusted the matter would soon be taken up, and uniformity of system obtained. There was, however, no fear, while the supply of ores in this country was so great, that our Yankee cousins could compete with us. They were a rich and prosperous people, and could, by getting their rails here, open their backwood trade. This reminded him of the remark of a Staffordshire labourer, who once said to him, "Send us down plenty of loaves and meat, and we will send you iron." If they would but take off the duty, the English would supply them with whatever rails they required, and then there would be no want of that friendly intercourse which now existed, and which, he trusted, might long continue.

Mr. BEVAN thought that the discussion as to what our ironmasters were doing in England was not relevant to the present paper, which he understood to have special reference to the iron-making resources of the United States. Professor Wilson had informed us that the fields of coal and ironstone in the United States were inexhaustible, and in the proportion of about one square mile of American to one acre of British, while the quality was superior to that of the British minerals; and that, as the treasures lay, for the most part, above water-level, the cost of "getting" was obviously much cheaper than in England, where the mineral operations were obliged to be carried on, to a great extent, under water-level, by expensive pits and costly driving arrangements. In addition to all these favourable natural conditions, the Americans enjoyed as large a share of acquired advantages as ourselves, in the wide ramification of railways and canals which covered their country. It seemed, therefore, of great importance to the makers of this kingdom to ascertain accurately how it was that the Americans, possessing all the great elements requisite for the production of iron, and with such superior means of transport to their principal markets, were still unable to compete with us, who had to contend with heavy charges of freights and duties, amounting to about eighty per cent. upon the English shipping price. If Professor Wilson would explain this anomaly, it would be valuable information to our iron-makers, to whom it was an object of first importance to keep so good a customer. With regard to Renton's furnace, he thought the comparison should be between the cost of the British puddled blooms and the American Renton's bloom, rather than between the Scotch pigs and the Renton's bloom.

Professor WILSON stated that he would endeavour to reply to the observations that had been made in the order in which he had noted them down. Mr. Gladstone wished to know the cost of iron per ton as made by Ren-

ton's process; the same question was put more fairly, also, by Mr. Bevan, who said the comparison should be made between this and the *wrought* iron, not the pig, of the ordinary process; but it was one which he was hardly in a position to give a definite reply to. He thought it could not much exceed the cost of refining and puddling in the ordinary process. In Renton's furnace the arrangements were very inexpensive, and the only additional labour required was for pulverising the ores and charging the chambers. Mr. Macgregor, who, he understood, was chairman of the Llynvi Valley Iron Company, had, probably well considered the money part of the question, and would certainly be able to give a more correct estimate of the cost of manufacture. Mr. Gladstone appeared to doubt the practicability of bringing ores to this country, as, owing to the extent of the cotton and corn traffic, the freights would be taken up at a price too high to admit of the transport of such heavy, low-priced, materials as ores. Now, his opinion in its favour was mainly based upon the extent and nature of this trade, which would enable the ore to be carried as ballast, at a cost not exceeding 10s. per ton; indeed, a gentleman had just informed him that he was now shipping another mineral to this country at only 4s. per ton.

Mr. BIRD.—To what part?

Professor WILSON.—From New York to Liverpool.

Mr. GLADSTONE thought Mr. Wilson argued on the presumption that the iron ore was brought to New York without cost.

Professor WILSON said that that would, of course, be an additional item, but they must recollect that these rich magnetic oxides contained from ten to fifteen per cent. more iron than the market hæmatite ores, while, at the same time, they contained no water—another saving of some ten per cent. As regarded the questions of labour and temperature which had been alluded to by Mr. Gladstone and by Mr. Davis, he would observe, that the cost of labour in the States certainly did not exceed the wages at present paid in this country, and that their iron-making operations were never arrested by either the intense heat of their summer, nor the intense cold of their winter. He himself had visited the principal iron districts of the country during the summer of 1853, when the temperature marked 135° to 140° Fahrenheit, and although it certainly was very hot, it was no obstacle to the works. In this country, where the past winter had been unusually severe, inconvenience no doubt had been felt in obtaining supplies, from the continuance of the frost, especially by those who were not provident enough to secure a good stock of materials at hand. He would now take the observations of his friend Mr. Bird. The first, as to the relative cost of manufacture by the improved processes he had already noticed, and although Mr. Bird had quoted Gartsherrie pigs as having been sold at 36s., he would not venture to tell us that that was a remunerative price.

Mr. BIRD.—There were six brothers there, and they had each of them purchased estates worth £100,000 a piece.

Professor WILSON.—Not out of their profits while their pigs were at 36s. Mr. Bird also objected that the 1,500,000 tons of wrought iron manufactured annually in this country could not be made by Renton's furnace. Did they not pass, he would ask, through the present puddling furnace, and it appeared to him that this new process would turn out as much work as the ordinary puddling furnace—say, about 50 cwt. in the 24 hours. The argument used in reference to the want of means of transporting the home-made iron from one State to another, would operate quite as strongly against iron imported from this country. The facilities, however, were greater than our people were aware of, as, taking extreme points, from New York to Chicago, a distance of about 1,500 miles, the rates for railroad iron was only 3½ dollars per ton. The existence of so valuable a mineral as iron-ore or coals in the present day, speedily determined the location of an industry, or of

such means of transportation as should render it available to the purposes of industry. Ask the Ebbw-vale Company whether the recently-discovered spathic ores of Somersetshire would be left in their present spot, or whether they would not speedily find their way across the channel to their furnaces? He cordially agreed with Mr. Bird's remarks on free trade, and regretted that a pig of iron should have such travelling difficulties to contend with as those so humourously described by Mr. Bird; these, however, had reference to English railways and continental conveyances, rather than to the subject now before the meeting. Dr. Percy inquired whether the clay iron-ores could be used in the new process! There was no reason why they *could* not, but there was a reason why they *should* not, when the richer magnetic oxides and hæmatites were more abundant and more readily procured. It was quite true that the ores used in this country contained some of the impurities complained of, as phosphorus and sulphur—at the same time these substances were contained also in the fuel, but the real damage done was due to the high temperature of the blast furnace, which caused the combination of these impurities with the pig-metal produced. This was avoided in Renton's process. Notwithstanding the high authority of Dr. Percy in all such matters, the Americans would not be disposed to adopt his suggestion of seeking for the 2 per cent. of potash which the slags contained. It evidently did not occur to him that we at present drew nearly the whole of our supply of potash from that country. His remarks in reference to the Swedish furnace, as well as some subsequent ones of Mr. May, tended materially to strengthen the original observations as to the comparative indisposition of our ironmasters to seek for or adopt improved processes. Mr. Davis instanced the successful career of Sir J. Guest, and of the Messrs. Baird, as evidence in favour of the ironmasters' enterprise and desire to advance their industry. This would indicate good judgment, good luck, and good times; but ought not by itself to be taken as evidence of advanced operations. Professor Wilson concluded by stating, that the want of capital, and the at present only partially developed state of the iron industries, were the principal reasons why the home production was at present unequal to supply the consumption of the United States.

Mr. MAX, in explanation, said that he intended to convey the impression that ironmasters were not so fully open to the adoption of improvements as they might be. With respect to the duties levied on iron imported into America, he was rather surprised that so acute and intelligent a people did not see, that if they would only permit rails to come in free of duty, it would stimulate their own iron manufacture in the supply of rolling stock and fittings, &c., which required a large proportion of all the iron used on railways.

Mr. CAMPBELL, of New York, would, with the permission of the noble chairman, reply to the inquiries of one or two gentlemen in reference to the difference in the cost of making blooms by the old and the new method. In the United States the difference averaged about 25 per cent. in favour of the Renton process. At Newark, New Jersey, a ton of bloom was made at a cost of 29 dollars, a large portion of which was paid for the raw materials, the ore and coal being remote from the works, and subject to expensive transportation. The quantity necessary to make a ton of blooms cost about 10 dollars each, making 20 dollars, which left 9 dollars for labour and all other expenses. Of course, in localities where those materials were cheaper, iron, by this process, would be made at a corresponding reduction in cost. In reference to the manufacture of iron generally in the United States, he would remark that the prominent difficulty in the minds of several gentlemen, appeared to be the transportation of the article from its insulated position to a market at the seaboard. At present, and probably for years to come, the Western States would require the largest proportion of iron consumed in that country, and the fact was over-

looked that iron manufactured in the interior was, in most cases, adjacent to the channels of navigation, and already half the distance from the seaboard to its destination and place of consumption in the west, while English rails landed at New York had to pass through the same channels, double the distance, and at a corresponding increase in cost of transportation. American rails were generally very much superior in quality to English, and were invariably preferred for curves, and all places requiring the best iron; and such was the desire for these rails that the manufacturer found a ready market at his own furnace for all he could produce. In reference to the inability of Americans to compete with the English in this department of industry, Professor Wilson had very properly remarked, "that they had not the necessary capital," and he would add, that America was comparatively a young country, with a rapidly increasing population, and a large portion of her capital was employed in opening up channels of navigation and communication for developing the vast resources of the great west. Several individuals and companies in the United States commenced the manufacture of iron with sufficient capital and experience to prosecute it on a large and profitable scale, and had amassed fortunes, while a far greater number commenced with inadequate capital and experience, and consequently had had to struggle with pecuniary embarrassments, with the attendant consequences.

The Noble CHAIRMAN said, that he could not help expressing his regret when, looking around that room, he missed a face long familiar to the members of the Society. He was perfectly aware that that was not the moment to indulge in such feelings, but in the late Mr. Joseph Hume the country had lost a great and high character, and the Society of Arts an earnest and energetic friend, who ever had its interests deeply at heart. This much he thought he might say as an expression of what he himself felt, and what he had no doubt was felt by all present. With reference to the paper read by Mr. Wilson, he was sure that if they all derived the same amount of instruction from it that he had it would not be necessary for him to ask them to give to him a vote of thanks. There had been times when if the principle speaker of the evening had introduced the subject of American rivalry in trade, he would have given rise to some amount of jealousy, and the president of such an assembly would have felt somewhat uneasy; but in every assembly of liberal men in this country it was now an acknowledged thing, that the time was passed when to depreciate, intellectually or physically, their cousins on the other side of the Atlantic was considered a mark of their own superiority. As an iron-master himself, he had felt some twinges at the prospect of American competition, and it was, therefore, very satisfactory to him to hear of the power possessed by England for such a competition; but his greatest comfort was derived from what fell from Professor Wilson himself, and it was strengthened by the last observations of Mr. May, namely, that in proportion as the American iron trade increased the import of iron from this country had increased in a still greater ratio. Although he was not himself sure on the point of a lack of energy, he had to say, that great energy had been and was being directed to the improvement of that trade. He congratulated Professor Wilson on the success of his mission to America. The valuable report which he had drawn up and presented to her Majesty's Government had not only increased his reputation, but had justified the Government in having selected him to undertake the duty.

The Secretary announced that the Paper to be read at the meeting of Wednesday next, the 7th of March, was, "On the Sewage of London; its Composition and Value as a Fertilizer," by Mr. J. B. Lawes.

CIVIL SERVICE REFORM: THE COLONIAL OFFICE.

[From Reports of Committees of Inquiry into Public Offices.]

The appointment of proper persons to fill the situations of permanent Under Secretary, Assistant Under Secretary, and Précis Writer, must be left to the conscience and the judgment of the Secretary of State, and it is so extremely important, both to the public interest and to the Secretary of State himself, that these offices should be effectively executed, that the best selection is likely always to be made of which circumstances admit.

But in providing a proper succession of senior clerks for the part which they have to perform, a great deal remains to be done. In this case the previous training, being entirely within the walls of the office, depends upon the measures taken by the Government for the purpose, and as the field of selection is very limited, the preparation and instruction of the small number of persons from among whom the senior clerks must be appointed, is a matter of serious public importance. The training given to the clerks in the Colonial office is, nevertheless, at present of the most imperfect kind.

They generally receive their original appointments to the establishment before their education is finished or their characters are developed; and the early age at which they become their own masters, the dry and distasteful nature of the duties assigned to them, and the various attractions of a London life, are very unfavourable to the formation of those habits which make good public servants.

As there is no examination previously to admission, there is no security that the persons admitted possess the talents and attainments which will render their services valuable on promotion to higher stations in the office. The year's probation, although it answers useful purposes of its own, cannot supply the place of a preliminary examination, partly because the duties which are at present allotted to young men on first entering the office are not such as to furnish any test of fitness for the higher situations, and partly because a faithful report upon the conduct and qualifications of the probationer cannot easily be obtained after habits of personal intercourse have once been established.

The training which the present constitution of the body of the establishment affords is by no means calculated to develop the talents required for the successful transaction of the serious business of the office. While the functions of the Colonial office are remarkable for their variety, importance, and difficulty, and experience and ability of a high order are necessary for their proper performance, the official education partakes in a great degree of a mechanical character. Although there is a separate department of the office in which persons on the footing of law stationers' clerks are employed, under the superintendence of a clerk, in copying official papers, the greater part of the work of this description is still done by the gentlemen on the establishment, who are also charged with the duty of making up, directing, and sealing the despatches, and of keeping, arranging, and producing, as occasion requires, the current papers of the office. The first years of official employment are those in which the knowledge, the self-confidence, and the aptitude for business required for the proper discharge of difficult and responsible duties should be obtained, and it is much to be regretted that persons likely to succeed to important situations in the public service, should have occupations assigned to them at this critical period of life which are unimproving and unsuited to their education and prospects, and, as such, likely to give them a distaste for their profession. If, after ten or fifteen years spent in incessant copying and other routine work, the spirit, the mental activity, and the wide extent of acquired knowledge necessary for vigorous intellectual exertion in the transaction of business like that of the Colonial office are wanting, it is the fault of the system, and not of the individuals who have been placed in circumstances so unfavourable to them.

The honours and rewards of the establishment are removed by so many gradations from a young man on his first admission, and he has to pass so long a period of obscure labour before he can hope that his exertions will attract the notice of the Secretary of State, that the prizes of the office have practically little influence on him. There must be something very defective in a system which does not hold out the usual motives to professional exertion, and fails to secure for the public service the zeal and activity of early manhood, because it does not offer any scope for a just and reasonable ambition.

According to the *theory* of the office, a clerk can reach the first class only after he has been promoted three times on the ground of superior merit, the claims arising from length of service being provided for by the annual increase of salary within each class; but, practically, it has been found very difficult to enforce the principle of promotion according to merit, even in filling up vacancies in the senior class, while as regards the other classes of the office, the *habit* has been to promote everybody in his turn, without regard to comparative merit or qualification. In making this statement we must be understood only as describing what has been the general practice of the office on a review of a series of years, for we are aware that there have been exceptions. When considerable changes took place in the office while Lord Ripon was Secretary of State, the rule of seniority was altogether departed from; and when vacancies have occurred since Lord Grey has been Secretary of State, his lordship has in each case called upon the permanent Under Secretary of State to report what member of the class below that in which the vacancy had occurred, he considered the fittest to succeed to it, distinctly stating that, except in cases of equality of merit, seniority was not the principle on which it was right that the selection should be made. We believe that it will be impossible to overcome this tendency, and to give to official promotion the stimulating influence it ought to have, while the office is constituted as it is at present. In the minutes of evidence taken before the recent Select Committee on Miscellaneous Expenditure, the following question and answer appear in reference to the Colonial Office:—

"2298. When a gentleman in the office has risen to the highest scale of remuneration, is it entirely in the discretion of the Secretary of State to select whom he pleases for the Senior clerks?—It is undoubtedly in the power of the Secretary of State to do so; but it is a limited power, because parties feel a reasonable expectation, supposing them to have done their duty, that they would hardly be interfered with by the Secretary of State."

The fact is that the duties in the lower classes of the office are to so great a degree of a manual and routine character, that they do not furnish a suitable test of fitness for the more difficult and responsible functions of senior clerk; and when a person has done well what was given to him to do, it seems unreasonable to withhold his promotion on the ground of supposed unfitness for higher functions in which he has never been tried. The principle of promotion according to merit, is also not likely to be consistently acted upon, while the Secretary of State is not personally acquainted with the manner in which the respective candidates discharge the duties entrusted to them, which it is impossible he can be according to the present system of the office; and, lastly, as the scale of salary at admission is fixed below what is sufficient for the respectable maintenance of a family in the rank of life to which the clerks belong, on the ground that by ordinary attention to ordinary duties promotion can be secured to a higher class, the principle of preferring superior merit cannot at present be strictly applied to the junior classes of clerks in the Colonial office.

The considerations above adverted to appear to us to call for a decided change of system, based upon the principle of establishing, by degrees, a clear distinction between those kinds of labour which call for the exercise

of the higher intellectual faculties, and those in which good penmanship, and common attention to exactness and regularity, are all that is required; and of applying to each of these descriptions of agency the motives and facilities appropriate to it.

The measures we would recommend for this purpose are as follow:—

1. To retain the situations of permanent Under Secretary, Assistant Under Secretary, and Précis Writer, and as many of the senior clerkships as experience may prove to be necessary.

2. To establish as a permanent prospective arrangement a single class of clerks below the rank of senior, which class should be entirely employed in assisting the superior officers of the department in the execution of duties of an intellectual kind, should consist only of as many persons as may be found by experience to be required for this purpose, and should be remunerated by salaries commencing at £150 a year, and increasing at £20 a year to £400.

3. To make the first admission into this class of clerks conditional upon the candidate being not less than 20 and not more than 25 years of age, and upon its being shewn, by the result of a suitable examination, that he is highly educated, and of unequivocal ability; and also to subject him to a year's probation after his admission, as a further test of his power of application and aptitude for business.

4. To lay it down as a rule never to be departed from that promotion from this class to the higher situations in the office is in every case to be conferred upon the person best qualified to succeed, seniority affording a ground for preference only in cases of equal merit. And

5. To employ under the superintendent of copyists, as many persons, to be paid at the existing rates, as may be required to do the whole of the copying and other merely manual work of the department.

If this plan were strictly carried out, we think it would ultimately have the effect of raising up a class of public servants who, besides that ample departmental experience which is the peculiar qualification of the senior clerks, would often possess general attainments rendering them eligible for the situations of précis writer and assistant under secretary of state; and the course recommended by us therefore harmonises with the view taken by the late Select Committee on Miscellaneous Expenditure in their report upon the Colonial Office, that "these offices ought to offer premiums for ability and good service to the department, without confining the Secretary of State necessarily to the selection from that body."

If it shall be determined to adopt the plan we have recommended, it should be gradually carried into effect as circumstances permit. All the clerks belonging to the second, third, and fourth classes of the establishment should, in fulfilment of the expectations under which they entered the office, continue to be eligible for promotion to the classes above them, and the appointment of clerks of the second class on the new footing should not commence until at least the whole of the present fourth class has become absorbed, and vacancies have begun to occur in the third class. We are, however, of opinion, that the *spirit* of our recommendations might be at once acted upon, even as regards the persons now on the establishment, by arranging that those among the junior members of the establishment who have shown more than usual diligence and capacity should be employed, as far as possible, on work which will enlarge their knowledge of and improve their aptitude for business, and by making the promotion from class to class depend upon superior merit and qualification in a much greater degree than heretofore. As vacancies occur on the establishment, such number of additional copyists should be appointed as may be required to do the whole of that description of work.

In the view which we have taken of the defects of the existing system of the Colonial office, and of the general nature of the measures required to remedy them, we have

the entire concurrence of Sir James Stephen, and, we believe, of all the officers now belonging to the department who are most competent to form an opinion. The plan proposed by us is also in accordance with the principle upon which the Treasury establishment has recently been reformed, nearly similar circumstances in that office having led to similar results.

But the most striking confirmation of the soundness of the view which we have taken is to be found in the experience of the India House, the business of which is of the same general character, both as regards its importance and difficulty, as that transacted at the Colonial office. Previously to the year 1831, there was only one establishment of clerks at the India House, rising by successive gradations from a very low to a liberal salary, and employed both in copying and other routine work, and in duties of a much higher kind; but in the above-mentioned year a change was made, the nature of which will be best understood by a perusal of the following extract from the regulations of the India House:—

"That every established clerk appointed be allowed on his admission a salary of £80 for the first year, and that an increase of £16 be annually made until he shall have completed his twentieth year of service, and attained the maximum of £400 per annum, when all increase under the regulations will cease.

"That as there are duties in all the offices the responsibility and importance of which will require the allowance of higher salaries to the clerks performing them than will be attainable by the preceding scale, fixed salaries be established for a certain number of superior stations, to be drawn by the parties filling such stations, without reference to length of service.

"That promotion to the stations with fixed salaries be in every case conferred upon the party best qualified to succeed, seniority affording a ground of preference only in cases of equal merit."

It is also the practice at the India House to have the copying and other merely routine work done by persons paid by fixed rates, acting under proper superintendence.

This system is represented by the Secretary, Sir James Melvill, who has kindly furnished us with detailed information on the subject, to have answered its purpose extremely well.

We have suggested that the salaries of the new second or probationary class of clerks at the Colonial office should rise from £150 to £400, instead of from £80 to £400, which is the scale in force at the India House, because we are of opinion that the duties at the Colonial office require qualifications of a higher kind than the greater part even of those at the India House, and that it would therefore be advisable to give a rate of salary immediately upon admission which would afford a respectable maintenance for a young man who has been educated at one of the Universities.

REPORT OF THE AMERICAN COMMISSIONER OF PATENTS.

TO THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.
SIR,—I have the honour to submit the following report for the year 1854:—

The condition of the office at the present time, and also as compared with previous years, will be seen in a general way by reference to the following statements, numbered 1, 2, 3, and 4:—

I.

Statement of Monies received at the Patent-office during the year 1854.

	Dols.	Ct.
Received on application of patents, re-issues, additional improvements and extensions, caveats, disclaimers, and appeals	134,125	00
Received for copies and for recording assignments	13,664	84
Amount reimbursed to Patent Fund for Act 4th Aug., 1854	16,664	84
	163,789	84

II.

Statement of Expenditure from Patent Fund during the year 1854.

	Dols.	Ct.
For Salaries	51,000	85
" Additional compensation for Act April 22, 1854 (including 6 months in 1853)	8,827	59
" temporary clerks	32,750	86
" books for the library	3,772	28
" contingent expenses	32,339	78
" agricultural statistics and purchase of seeds	2,838	00
" librarian	700	00
" payments to judges in appeal cases	475	00
" refunding money paid by mistake	302	00
" " on withdrawals	34,139	96
	167,146	32

Excess of expenditure over receipts during the year	3,356	48
Excess of withdrawals this year over last	10,673	22

III.

Statement of the Patent Fund.

	Dols.	Ct.
Amount to the credit of the Patent Fund, Jan. 1, 1854	28,950	0
Amount paid in during the year 1854 (including 16,000 dols. reimbursed by the Act of Aug. 4, 1854)	163,789	84
From which deduct:—	192,739	84
Amount of expenditure during the year	167,146	32

Leaving in the treasury, 1st Jan., 1855 25,593 52

IV.

Table exhibiting the business of the office for fourteen years, ending Dec. 31st, 1854.

Years.	Applica- tions filed.	Caveats filed.	Patents issued.	Cash received.	Cash expended.
1841	847	312	495	40,413 01	23,065 87
1842	761	291	517	36,505 68	31,241 48
1843	819	315	531	35,315 81	30,776 96
1844	1045	380	502	42,509 26	36,344 73
1845	1246	452	502	51,076 14	39,395 65
1846	1272	448	619	50,264 16	46,158 71
1847	1531	533	572	63,111 19	41,878 35
1848	1628	607	660	67,576 69	58,905 84
1849	1955	595	1076	80,752 78	77,716 44
1850	2193	602	995	86,927 05	80,100 95
1851	2258	760	869	95,738 61	86,916 93
1852	2639	996	1020	112,056 34	95,916 91
1853	2673	901	958	121,527 45	132,869 83
1854	3324	868	1902	163,789 84	167,146 32

From this last statement, it appears that 3,324 patents have been applied for within the past year, which is an increase of 651 over the applications of the previous year. The number of patents issued in 1854 is nearly twice as great as in 1833.

The number of cases in the office awaiting examination on the first day of January, 1854, was stated in the report of last year to have been 582. Owing to an imperfect mode of computation, this number was found to be incorrect. An actual count showed that there were really 823 cases on hand and undisposed of at the commencement of the past year. That number is now reduced to 89, so that the work of the office can hardly be regarded as being at all behind-hand. Applications are now acted upon within a very few days after being made.

The receipts of money from all sources during the past year amount to dols. 163,789.84, and the whole expenditure has been dols. 167,146.32. This exceeds the receipts by dols. 3,356.48. Among the receipts is included

the sum of 16,000 dols., refunded to the patent office for expenses incurred, partly in 1853, and partly in 1854, in fitting up the rooms for the new building and for other similar purposes, so that the revenue arising from fees alone, during the year 1854, has been only dols. 147,789.84. This falls short of the actual expenditure by dols. 19,356.48.

This excess of expenditure has resulted partly from the additional compensation allowed by the Act of 22nd April, 1854, to clerks and other persons employed in the office, in accordance with which the sum of dols. 8,827.59 has been paid during the past year, as appears from the foregoing statement, No. 2.

The expenditure has also been very much augmented during the year, by the necessity of repairing a large number of the models in the office, and also of cleansing, varnishing, and removing them to their new receptacle. The crowded condition in which it has heretofore been necessary to place them, has resulted in numerous and great injuries, which it was incumbent on the office to repair; they will be in a great measure exempt from such injuries in future.

But the largest item of extraordinary expenditure has resulted from the augmentation of force necessary to dispose of the accumulation of arrearages before mentioned. The number of cases now on hand is less by 734 than that which existed a year previous. The fees of these 734 cases (amounting to more than 20,000 dols.) were received in 1853; the labour has been performed, and the expense incurred in 1854. The entire income which has resulted from all the cases disposed of during the past year has been greater than the whole expenditure of that year.

It is therefore possible that the receipts for the coming year may be nearly or quite equal to the expenditure, if rigidly confined to those things which are indispensably necessary. There are, however, some matters which, though not altogether indispensable, seem to commend themselves strongly to the favourable consideration of Congress, and which will call for some increase of expenditure in future.

Among these may be reckoned, in the first instance, an increase of salary to some of the Examiners. In the report for last year, it was stated that the examining force had been augmented by placing an additional clerk in each of the examining rooms, as a second assistant-examiner. The dispatch of business in the office was much facilitated by this management, which was, however, found inadequate to the rapid increase in the number of applications. It was therefore thought expedient to place several of the assistant-examiners in charge of duties which had previously been entrusted only to the principal examiners. Accordingly, on the first of April last, five of the assistant-examiners were each intrusted with the charge of an independent examining desk, so that, for nine months of the past year, there has been eleven separate and independent examining-rooms, with each an acting principal and assistant-examiner. These assistant examiners, who have thus been performing the duties of principals, and the clerks of the second class, who have been acting as assistant-examiners, seem to have just claims to be placed on a footing of equality, as to compensation, with others who are performing the same duties, and are subject to the same responsibilities. The necessary examinations cannot be made with proper promptness with a less force than ten principals, and as many assistant-examiners, and should the business of the office continue increasing, as it now promises, before the end of the present year we shall need twelve of each class of examiners. The number should, therefore, I think, be increased to that extent at once, or power given to the Commissioners, so as to increase it as soon as occasion requires. The business of the Patent-office progresses or lingers in precise proportion to the efficiency of the examining corps. The increased expense of supplying a few additional examiners is trifling in comparison with the advantage of having the

business of examination despatched in a few days after the application is made, instead of obliging the applicant to wait as many months for that purpose.

The Report for the year 1853 was illustrated with wood-engravings, which, though somewhat imperfect, are believed to have added much to the value of that report, by rendering it vastly more intelligible than it could otherwise have been made. Steps have more recently been taken to improve still further in this particular by providing copperplate engravings for the purpose. A conditional contract has been made with a competent artist, which, if approved by Congress, will render the report for the year 1854 highly creditable to the office, and eminently useful to the public. I feel great confidence that the advantages resulting from these illustrations will fully justify the increased expenditure thereby rendered necessary.

The present rate of fees has been in existence for more than sixty years, with but little variation. During that time the intrinsic value of money has been very essentially diminished. The labour and expense thrown upon the office has been more than doubled by the change which took place in 1836, and the additional compensation more recently provided for clerks and other persons employed in the office, has still further contributed to swell the ratio of expenditure to that of revenue, and to call for a new tariff of fees, in order to prevent the necessity of curtailing the expenses of the office in a way which cannot but be prejudicial to the best interests of those by whom those fees will be paid. It is believed that the inventors themselves would prefer a sufficient augmentation of the rate of fees to enable the business of the office to be promptly and successfully conducted, rather than to save a few dollars at the expense of great vexation and delay in obtaining official action upon their applications for patents.

In my last annual report the attention of Congress was invited to the consideration of the propriety of abolishing all discrimination in the rate of fees, as between citizens and aliens; subsequent reflection has only confirmed the opinion then entertained and expressed on that subject.

Some of the beneficial results of the liberal policy then recommended, in inducing a like liberality on the part of other nations, are already sufficiently obvious.

At the present time the laws of Canada do not permit our citizens to obtain patents in that province under any circumstances, which causes great inconvenience and loss to our inventors. All machines invented here can be made and used in Canada without any license from the American patentee, and the products of those machines can, with little trouble or expense, be brought into our markets to compete with like commodities manufactured here by persons who are obliged to pay for the right to use the patented machines for that purpose. This operates like a discriminating tariff against the home manufacturer, which cannot but be prejudicial to his interests.

Reliable information, of a private character has, however, been received, to the effect that the Canadian Parliament is taking steps to remove this cause of complaint. A bill was introduced into that body at a recent session (which has been adjourned over to some time in the present month), and is still pending, which contemplates allowing American inventors to obtain patents in Canada, and the only cause of complaint as to its becoming a law is believed to grow out of the enormous fee demanded by this office from all Canadian inventors. The proposed modification in our rate of fees would, doubtless, be followed by the desired change in the Canadian law. This would remedy the difficulty complained of by our inventors, above alluded to, so far as future patentees are concerned, and might, perhaps, do so in relation to patentees of a previous date.

It may be thought that we shall best attain our object by retaliatory measures. Such a course would be calculated to arouse angry and hostile feelings, rather than to lead to any final advantage to either party. A course

dictated by kindness and liberality will soon dissolve the barriers which make nations strangers and enemies. We can well afford to lead the way in a course of measures which will contribute no inconsiderable share towards rendering us and our Canadian neighbours practically one people.

I take the liberty of inviting the attention of Congress to the other matters treated of in my report for 1853, to which I have nothing to add at present.

Very respectfully yours, &c.,

C. MASON,
Commissioner of Patents.

Home Correspondence.

THE DISCUSSION ON DECIMAL COINAGE.

SIR,—The sudden close of the discussion on Wednesday evening having precluded the authors of the papers from the reply usually allowed them, I beg the favour of space for a few observations.

Two objections were made to the scheme of adopting the florin as the unit or leading coin of account, and having only one other coin of account, the hundredth of the florin.

The first objection was, that it is not strictly a decimal system. In answer to this it appears sufficient to refer to the fourth paragraph of my paper, in page 222 of last Journal, in which this objection is anticipated and disposed of.

The other objection was, that it is a matter of indifference where the decimal point is placed, the same work being required whatever position it occupies; that, in fact it is the same whether we consider 2,345 cents (hundredths of a florin) as £2.345 cents, or as 23 florins 45 cents.

It is so theoretically, but there is a wide difference in the facility of dealing with the two forms in practice. If we wish to compute the cost of two articles at 23 florins 45 cents. each, any ordinary arithmetician at once sees that the two will cost 46 florins 90 cents, and so of numbers of other simple operations. But if the question is presented in the form of "two articles at £2.345 cents each," clubbing together the three right-hand figures as cents, they present a combination the value of which is less obvious, and which few but expert arithmeticians can deal with mentally.

It may be said that the mind would remove the 3 to beside the 2, and operate with the figures as 23 and 45. Very few would readily perform that operation. Gentlemen occupied as actuaries, bank-cashiers, or teachers, whose vocation it is to be expert at figures, can, of course, easily do a thousand feats with numbers; but the great majority of those who are not compelled professionally to be proficient in arithmetic, will look at things only as they are set before them, and will have it indelibly fixed in their minds, that the fourth place, and all to the left, mean pounds, and the first three figures mean cents; they will become familiar with the figures, as expressing pounds and cents, and be practically unable to operate with them unless in that shape.

It may, perhaps, be further urged that if—to continue the above example—the three figures, 345, are more difficult to deal with, there is a figure fewer in the higher denomination, which would be, therefore, proportionately easier to calculate with. But it must be borne in mind that the great majority of money transactions, especially among the less educated classes, are with small sums, involving few florins or pounds, sometimes none, but always including the less coin, and that there is an impassable gulf to all ordinary persons between arithmetical mental operations with *two* and those with *three* figures. Hence the numbers expressing the lower coin should be kept in as simple a form as possible, that is, be

limited to two figures. Thousands, and these with imperfect powers of calculation, have to deal with sums under £10 (and only these can be expressed decimally with four figures), such as £8.314 cents, £5.101 cents, 913 cents, £1.387 cents—for one who has to pass the amount of £10; and it appears sufficiently obvious that the easiest form for such sums is 83 fl. 14 cents; 51 fl. 01 cent; 9 fl. 13 cents; 13 fl. 87 cents; in short, the great majority of people have to deal with small sums, and it is for the benefit of that majority that such sums should be expressed and operated with in the simplest form.*

There is an obvious advantage, too, in having a low unit of account, as thereby quantities of the small coin or change are sooner brought to their ultimate form, in which no further operation is to be performed on them; and although there may, in many cases, be a figure more of the larger coin, this matters little, as the mind, by practice, will soon come to appreciate its value instantaneously, and it is seldom that very many figures of it will be required.

It is worthy of remark that the leading states which have adopted a decimal coinage, have only two leading coins, which are to each other as 1 to 100, and the higher of which is of a comparatively low value, varying in the different countries from 7½d. to 4s. 2d.

In next week's Journal, if you will oblige me, I shall endeavour to exhibit, by a few simple tables, the real points at issue between the advocates of the pound and of the penny.

Your's, &c.,

H. REID.

February 17, 1855.

SIR,—The opportunity of a reply not having been afforded me last Wednesday evening, mainly owing, no doubt, to the lateness of the hour, I trust I may be allowed to offer a few brief remarks, chiefly in reference to the observations of Mr. R. R. R. Moore, the Secretary of the Decimal Association, on that occasion.

Throughout the greater part of the discussion less regard seems to have been paid to the paper I had the honour to read before the Society of Arts than to a small pamphlet entitled, "A Word in behalf of the Poor Man's Penny," which I published during the discussion on this question at the Institute of Actuaries in January and February last year, and which bore on the title-page the motto, "Penny Wise and Pound Foolish (?)." Had Mr. Moore wished to exhibit to the meeting of last Wednesday evening my particular views on the subject of a decimal coinage for this country, I submit it would have been fairer to have quoted from my subsequent paper, read before the Statistical Society in June last, and printed in their Journal for September. Mr. Moore was present on that occasion, and took part in the discussion which followed; so that he was acquainted with a more complete exposition of my views than what appears in the before-mentioned little tract. I contend, however, that Mr. Moore, in thus directing his opposition to the Penny-wise-and-pound-foolish pamphlet, as he is pleased to term it, was not altogether in order, inasmuch as I had been invited to prepare—and had closely kept the object in view—a short paper, not to explain any particular proposals of my own, but to advocate the *leading views* held in common by those who desire to see a decimal coinage established in this country, that shall not interfere with the value of the copper money so

* Mr. Yates, whose essay "On the French System of Measures, Weights, and Coins," gained a silver medal from the Institution of Civil Engineers, and is one of the best of the recent treatises on decimal coinage, observes, p. 91—"The use of three places of decimals, as in 625=12s. 6d., and 333=6s. 8d., would be intolerable in ordinary practice. The experience of all civilised countries showed that even the poorest and rudest persons had no difficulty in reckoning mentally by tens."—"But the proposed mode of reckoning continually in the head by mils up to 999 would be perplexing even to good arithmeticians."

extensively in circulation amongst us;* and it will not have escaped observation that my paper refers to Mr. Theodore Rathbone, Dr. Gray, and the late Mr. Laurie, as the leading supporters of this *sine qua non* of the *tenpenny system*. Whenever a fitting opportunity may offer I shall not be unprepared to discuss with Mr. Moore, or any one else, the particulars referred to in my previously published plans; at present I wish to confine my reply to some of the extraordinary statements made by this gentleman in his speech of last Wednesday evening.

Mr. Moore professed to believe that the proposal to create a new silver coin, such as the tenpenny, was fraught with danger alarming in the extreme. "He (Mr. Moore) ventured to say there was not a banking-house in London in which the clerks had not as much to do as they could get through now. The number of clerks must be increased in all the establishments if they adopted this new coin, and some of the banks were now so pressed for room to carry on their business, that the introduction of the new coin would actually involve the necessity, in the great majority of cases, of new premises, to make room for the new clerks."† Well, but Mr. Moore himself proposes a new silver coin—"We want a silver tenth of a florin—call it the cent,"‡ were his concluding words. A similar strain of useless oratory was levelled against my proposition for a gold coin of 100d., termed an *Imperial*—a question not before the meeting. Mr. Moore seems to think that I have not carefully considered the circumstances of the adoption of such a coin. "It would," he asserts, "double the labour of the counting-house—it would increase the number of clerks at every bank—it would cost as much to cut the die as for the sovereign—the wear would be rapid—they would soon become light—if they were made thick they would not ring, &c." Very well! if these be good objections, then coin *double imperials*, or any other more suitable multiple. Had Mr. Moore, however, glanced his eye over the collection of foreign coins on the table, he would probably have found gold pieces not very dissimilar to my imperial, and to which none of his fancied objections are found to apply. Mr. Moore will pardon me if I tell him he has been fighting a phantom of his own raising.

The objection made by the propounders of the tenpenny systems, that the lower coins proposed under the millesimal division of the pound sterling are incommensurable with the present copper currency, and, therefore, likely to prove injurious and confusing to the humble classes, is met by this champion of the Decimal Association with the reply, that even now the penny does not always meet the value of articles with exactness: an argument which, if it means anything, pleads the existence of an acknowledged wrong as a good reason for establishing a greater. Mr. Moore further illustrates his point, however, by informing us that the poor man would have such loss made up to him by having his *pound* of potatoes sometimes with a *few larger ones* in it! The great discovery this gentleman has made, that in £1000 there would be £48 7s. 7½d. difference, if that sum were expressed in *tenpennies* and French *francs*, shows how fond some persons are of mystifying the statements of others. We have nowhere asserted the equality of these coins, but simply urged that a general affinity with the units of currency of these countries to which reference was made, would be expressed by our most popular coins.

Reference was made by more than one speaker in this discussion, to asserted difficulties that would exist under the tenpenny plan for a decimal coinage, in transposing the present to the new money, and *vice versa*. Now it is

* During the past year there were coined at the Mint no less than 6,800,000 pennies, 12,400,000 halfpennies, and 6,500,000 farthings, constituting above 270 tons weight of copper money. The number of *florins* coined in the same period was 550,000 only.

† Vide Report of the Discussion, "Journal of the Society of Arts," No. 117.

‡ Value 2½d.

easy to see that at first any system that might be adopted would be attended with some amount of difficulty in this respect; in the case of the pound divided into 1000 *mils*, the process of conversion takes place at the lower end of the scale, where it presents the greater amount of labour, being opposed to the humbler and less educated class of people, and would be also of more frequent, because of almost constant occurrence. This difficulty is slighted by actuaries and others, who have to deal more commonly with pounds than with pence, and to whom the *mil*, or 1-1000th of a pound sterling, is of little consideration, because they are already practised in an easy method of converting, with sufficient exactness for their purposes, shillings and pence to the decimals of a sovereign. The tenpenny plan, on the other hand, has this difficulty of conversion at the upper end; it is, however, more especially opposed to the class of persons best fitted to cope with it. Pounds might be reduced to *tenpennies* by doubling the given sum, repeating the same operation with this last, taking care to place it one figure to the right, and then adding the two products. Example: Reduce £23 to *tenpennies*.

23

—

46

92

Ans. 552

Conversely; a sixth subtracted from half the number of tenpennies would be the amount in pounds sterling. A little practice would exhibit the facility with which such changes could be made, which would of course be required only until the system were generally used; tables, if desired, would serve to aid in this particular.

Before concluding I may notice that Mr. Miller speaks of the proposers of this plan as paying great deference to the penny, chiefly on account of its antiquity and name. A careful perusal of the pamphlets put forth in its behalf will, however, show that it is the *value* of the penny as a present representative of the cost of a great number of the commodities of the poor, that we really contend for; substitute other coins that will *exactly* represent the penny, and no opposition on this point will be offered. When, however, a proposal is put forth by which the shilling of the day labourer is made practically tenpence, it is not without reason that it is objected to. Did space allow, I would crave permission to make some reference to Mr. Brown's statements relative to the Decimal Association. Reserving this, however, for a further opportunity,

I remain,

Your obedient servant,
FREDERIC JAMES MINASI.

Islington, February 21st, 1855.

THE SMOKE NUISANCE.

SIR,—If Mr. Stevens had allowed his observations to remain uncorrected, he would have done well, and if he had refrained from referring to Mr. Fairbairn, he would have done better.

Where there exist the preliminary conditions of boiler room and draught, there is no need whatever for any invention patented within thirty years from this date. Where these conditions do not exist, the modern and antique inventions are alike of no use, and where they *do* exist, they can be done without.

The reason why smoke is discharged from furnaces possessing these requisites is, that they only afford the *means* by which the *discharge* of smoke may be *prevented*, while in many cases these means are not used, just as was the case at Miller and Co.'s, when I called on them with Mr. Stevens.

I thought I had stated very clearly that much more depended on the *management* of the furnace than on the nature of the *appropriate inventions* applied to it.

I have no bias against inventions, ancient or modern; nor, truly, against the inventors. I have, however, after

lengthened inquiries and patient investigation, formed *opinions* respecting both; and, with reference to the latter, I believe that, generally speaking, they are parties who re-invent something known long before, but not to them.

I did not omit all mention of my experience as Inspector at Glasgow. My whole paper was based upon that experience, and I referred specially to Juckes's furnace because that was the invention which was the panacea of the Smoke Committee then, and it was my experience there, which proved to my satisfaction that, for all "practical purposes," inventions are useless.

I do not know what are the leading propositions set forth by me which Mr. Fairbairn did not agree with. I have not with me at present a copy of the report, but from recollection I acknowledge Mr. Fairbairn thought a large boiler the principal requisite, and that he would encourage *all* inventors. I think that draught is the first thing required to consume smoke—the economy of that process will depend on the size of the boiler being adequate to the duty required from it.

I have not ignored all that has been done in the metropolis during the last 18 months. I am, for a person residing some hundreds of miles distant, tolerably well acquainted with what has been done, but I can see nothing whatever different from what has been done over and over again. A stir is made; out come numbers of inventions; they are applied; next appear flattering testimonials. Timid smokers, or those who "wish to do something," if but for a blind, apply them, and the humbug goes on. Whenever Lord Palmerston attacks some one with a long purse and spirit, the bubble will burst, unless the law be amended, and made reasonable.

Since Mr. Stevens has referred to Mr. Fairbairn, allow me to quote from that gentleman's evidence before Mr. MacKinnon's Committee. In answer to

Q. 604. Mr. Fairbairn said:—"I think there is no question as to the practicability of consuming the smoke, for it can be done in almost any instance, even by the common boilers, by proper care and attention on the part of the fireman."—Answer 611. "I think there is no difficulty, but that with proper management, *without any apparatus*, the fireman himself could effectually consume the smoke."

Q. 612. "WITHOUT ANY APPARATUS WHATEVER?"—Answer. WITHOUT ANY APPARATUS."

Q. 613. "But with the apparatus there is no question about it?" Answer. "There is no question about it; but even with the apparatus, *unless attended to*, the smoke *will* come from the chimney."

Really it is time that the delusion about smoke-consuming inventions be dissipated, and action taken based on sound principles.

But it may be said, these were Mr. Fairbairn's views twelve years ago; they are modified now. Fortunately, I can give you that gentleman's present views in a much more satisfactory form than when conveyed in a few words spoken at a Society's meeting. Some months ago, Mr. Fairbairn was, along with two other persons, employed by the authorities of Glasgow, to inspect certain furnaces there, and to report thereon. Here, then, we have an *official professional report* of but a few months date, and in no circumstances can I imagine that greater care might and would be taken to make a report upon which dependence could be placed by Mr. Fairbairn's employers. I know that I am entitled to speak of the report as *his* and *his only*, though, according to the Act of Parliament, it is given as the report of "three engineers, or other persons of skill in such matters." What, then, does Mr. Fairbairn recommend as the *best plan* for preventing smoke? He says "There are innumerable schemes and patents in operation for the consumption of smoke,—moving grate bars, Juckes's patent, Witty's universal smoke-consuming apparatus, and a hundred others; wishing, however, to avoid all complexity and unnecessary expense in construction, we are of opinion that the object

may be effected in one of three ways, viz:—1st. By a common circular boiler of sufficient power. 2nd. By the introduction of the double flue and double furnace boiler, with alternate firings, which is probably a more economical plan than the preceding. 3rd. By the introduction of one of the multitubular boilers, 24 feet long, 7 feet in diameter, with double furnaces, mixing chambers, and about 110 to 120 three-inch tubes, WHICH IS THE BEST AND MOST APPROVED PLAN." At another part of this report I find the following sentence:—"In fact, the whole secret of economy in combustion and the absence of smoke is plenty of boiler space, and that consideration should never be lost sight of in our attempts at improvements in that direction."

I quite agree in opinion with Mr. Fairbairn, that where economy and combustion of smoke are *jointly* the objects in view, a *comparatively* large boiler is requisite; but when the object is *only* perfect combustion and the prevention of smoke, the size of the boiler is immaterial, but draught, however obtained, is then the most important consideration.

The foregoing should prove that Mr. Fairbairn, though willing to encourage all inventors, does not now deem *apparatus* essential in smoke burning.

If Mr. Mansfield imagines that he or any other person who ascertains the best relative dimensions of furnaces, boilers, flues, and chimnies, by which the most perfect combustion may be attained, could obtain a patent for the exclusive use of such relative dimensions, I would recommend him forthwith to institute experiments and secure his discoveries by patent. But, a little reflection or inquiry of his patent agent, will soon satisfy Mr. Mansfield that such a patent could not be obtained, or, if obtained, could not be maintained in a court of law; and it is to this fact of relative dimensions being unpatentable, that we see the ingenuity of inventors turned to the contriving of *apparatus*. Now, no apparatus contrived for the admission of air above the fuel in furnaces will answer where the furnace and adjuncts are not properly constructed in the ordinary way, and of adequate relative dimensions; but, where the dimensions are adequate, air may be with advantage admitted above the fuel; and where the furnace is otherwise well managed, that is, the fuel supplied with care, the result will be perfect combustion and no smoke.

As I suppose my letter referring to Mr. Stevens' communication some weeks ago will appear with this in your next, I deem it unnecessary at present to notice Mr. Williams' review.

Yours, &c.,

G. W. MUIR.

P.S.—When speaking of *inventors*, I wish it to be understood that I consider the mechanical means invented by Brunton, Juckes, Hazledine, and Foard, reflect great credit upon them, but still their inventions are of no use except in very special cases.

Proceedings of Institutions.

LEEDS.—The Yorkshire Union Village Library, as has been on various occasions explained, was established for the purpose of providing those villages with books where no library at present exists. The books are lent in sections of fifty volumes (exchanged every six months) to every place where twenty-five subscribers at a penny per week can be found, with a librarian to take charge of the books. The attention of his Royal Highness Prince Albert has lately been called, by the hon. secretary, Mr. James Hole, to the plan, and it will gratify the friends and subscribers of this excellent Institution to learn that, as a mark of his warm approbation of the Village Library

and its objects, the Prince has presented a handsome donation of books to the Union. The books consist of—

	Vols.
Bohn's Standard Library	109
Knight's Volume, 160 vols. bound in	68
Longman's Travellers' Library, 75 parts bound in	18
Murray's Railway Reading, 30 parts bound in	16

Total 211

All are beautifully and strongly bound, and on the inside of the cover of each volume is a label with the inscription, "Presented to the Yorkshire Union of Mechanics' Institutes by his Royal Highness Prince Albert."

To Correspondents.

A letter from Mr. John Evans, in reply to that from Mr. Homersham, which appeared last week, as well as one from Mr. R. Davison, in reference to the "Iron Industry of the United States," stand over for want of space.

MEETINGS FOR THE ENSUING WEEK.

MON.	Royal Inst., 2. General Monthly Meeting. Architects, 8. Chemical, 8. Entomological, 8.
TUES.	Horticultural, 2. Royal Inst., 3. Professor Tyndall, "On Electricity." Civil Engineers, 8. Discussion upon Mr. Allen's paper, "On Steam and Sailing Colliers, and the modes of Ballasting," and "On the Application of the Screw Propeller to the larger class of Sailing Vessels," by Mr. R. A. Robinson. Linnean, 8. Pathological, 8.
WED.	Meteorological, 7. Society of Arts, 8. Mr. J. B. Lawes, "On the Sewage of London; its Composition and Value as a Fertiliser." Geological, 8. 1. Mr. M. H. Rosales, "On the Geology of the Ballarat and Creswick Creek Gold Fields, Australia." 2. Mr. M. F. Odenheimer, "On the Geology of the Peel River District, Australia." 3. Rev. Mr. Clarke, "On the Occurrence of Fossil Mammalian Bones in the Auriferous Alluvia of Australia." 4. Rev. Mr. Clarke, "On the Occurrence of Obsidian Bombs in Auriferous Alluvia of Australia." Pharmaceutical, 8½.
THURS.	Royal Inst., 3. Mr. Donne, "On English Literature." Medical, 5. Anniversary Oration. Antiquaries, 8. Royal, 8½.
FRI.	Astronomical, 8. Philological, 8. Royal Inst., 8½. Mr. T. Sopwith, "On the Mining Districts of the North of England."
SAT.	Royal Inst. 3. Dr. Gladstone, "On the Principles of Chemistry." Royal Botanic, 3½. Medical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS,

Delivered on 10th, 12th, 14th, 15th, and 16th February, 1855.

Par. No.	
45.	Steam-ship "Philadelphia"—Copy of Report.
47.	Bank of England—Annual Accounts.
50.	Civil Service—Supplementary Estimates, 1854-55.
40.	Small Arms—Return.
14.	Land Revenue (East India)—Return.
52.	Navy Estimates.
53.	Transport Service and Prisoners of War—Estimate.
51.	Army Estimates.
48.	Bullion, &c.—Return.
54.	Railway Acts—Return.
55.	Acts of Parliament—Return.
56.	Royal Military College (Sandhurst)—Return.
20.	Bills—Education.
21.	Bills—Mines (Ireland).
22.	Bills—Schools (Scotland).
	Poor Relief (Scotland)—9th Annual Report of the Board of Supervision.
	<i>Delivered on 17th and 19th February, 1855.</i>
23.	Poor Law (Ireland)—Return.
43.	Coffee (Crimea)—Copy of Correspondence.
57.	Promotion and Retirement (Army)—Copy of Royal Warrant.
49.	Metropolitan Police—Accounts.
	Factories—Reports of the Inspectors for the half-year ending 31st October, 1854.

SESSION, 1854.

484. Valuations—Return.
Delivered on 20th February, 1855.
25. Duchy of Cornwall—Account.
59. Russian Dutch Loan—Account.
60. Greek Loan—Account.
63. War with Russia—Dispatches from Governors of British Colonies.
Inclosure Commission—10th Annual Report.
Tithe Commission—Report.
Copyholds—13th Report of Commissioners.
Railways—Report upon the Accidents which have occurred during the year 1854.
Delivered on 22nd February, 1855.
58. Ordnance Estimates.
64. Exchequer Bills—Account.
23. Bills—Intramural Burials (Ireland).
25. Bills—Army Service Act Amendment.
Railway Accidents (1st July to 31st December, 1854)—Return.
Delivered on 23rd February, 1855.
42. Emigration (Australia)—Copies of Despatches.
65. Trade and Navigation—Accounts.
24. Bills—Poor Relief (Ireland).
31. Bills—Cathedral Appointments Act Continuance.
Delivered on 24th and 26th February, 1855.
24. Transports—Return (a corrected Copy).
66. Paupers—Returns.
69. Poor Law (Ireland)—Return.
70. Banks of Issue—Return.
72. Staff and Garrison Appointments (Colonies)—Return.
27. Bills—Newspaper, &c., Postage and Stamp Duties.
26. Bills—Public Prosecutors.
41. Bills—Militia (Ireland).
42. Bills—Commons Inclosure.
44. Bills—Lunatic Asylums (Ireland) (Advances).

SESSION, 1854.

489. Poor Removal—Return.
Delivered on 27th February, 1855.
71. Committee of Selection—1st Report.
74. British Ships—Returns.
76. Commissariat (transfer to the War Department)—Copy of Treasury Minute.
28. Bills—Sea Coast Fisheries (Ireland).
29. Bills—Iceland Fisheries (Ireland).
SESSION, 1854.
469. Mails on Railways—Return.
Delivered on 28th February, 1855.
- 40 (1). Small Arms—Return.
30. Bills—Dwelling Houses. (Scotland.)
33. Bills—Court of Chancery. (Ireland.) (Procedure.)
35. Bills—Court of Chancery. (Ireland.) (Sales of Estates.)
36. Bills—Court of Chancery. (Ireland.) (Appeals.)
38. Bills—Intestacy. (Scotland.)
40. Nuisances Removal, &c. (Amended.)
43. Dean and Woolmer Forests.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Feb. 23rd, 1855.]

- Dated 10th January, 1855.*
67. H. Bessemer, Queen-street-place, New Cannon-street—Ord-nance.
Dated 20th January, 1855.
161. J. H. Johnson, 47, Lincoln's-inn-fields—Seats. (A communi-cation.)
Dated 27th January, 1855.
207. J. Hutchinson, Huddersfield—Apparatus to economize steam.
210. E. Davis, Aldgate—Waterproofing paper.
Dated 3rd February, 1855.
253. F. S. Thomas, 17, Cornhill, and W. E. Tilley, 6, Kirby-street—Coating metals.
255. J. T. Chance, Birmingham—Glass pipes.
257. J. Patterson, Beverley—Washing, wringing, and mangling machinery.
259. J. Lippman, Paris—Dyeing skins.
261. T. Allan, Adelphi-terrace—Motive power.
Dated 5th February, 1855.
263. G. Pattison, Glasgow—Finishing woven fabrics. (A commu-nication.)
265. J. H. Johnson, 47, Lincoln's-inn-fields—Steam boilers. (A communication.)
267. P. A. le Comte de Fontaine Moreau, 4, South-street, Finsbury—Preserving railway tickets. (A communication.)
269. E. Hartnall, 1, St. Mary Axe—Preserving food.
271. J. Gibbons, 345, Oxford-street—Fixing spindles of door locks to knobs.
273. T. B. Daft, Isle of Man—Beds.
Dated 6th February, 1855.
275. J. Gedge, 4, Wellington-street South, Strand—Frames for photographic portraits. (A communication.)
277. T. Aston, Compton-street, Regent's-square—Communicating with drivers of carriages.

279. A. Warner, 11, New Bond-street—Coating sheet iron and steel with lead, &c.
281. P. Smith, Glasgow—Printing textile fabrics.
283. G. Audemars, Lausanne—Treating vegetable fibres.
- Dated 7th February, 1855.*
285. P. A. le Comte de Fontaine Moreau, 4, South-street, Finsbury—Motive power by heated air. (A communication.)
286. W. Warbrick, Dukinfield, and J. Walker, Compstall-bridge, Stockport—Spinning machinery.
287. J. G. Johnson, 18a, Basinghall-street—Surgical bandages.
288. G. T. Bousfield, Sussex-place, Loughborough-road—Steam ploughing machines. (A communication.)
289. E. Davies, Liverpool—New oil.
290. G. T. Bousfield, Sussex-place, Loughborough-road—Looms. (A communication.)
291. R. D. Chatterton, Cobourg, Canada West—Propelling vessels.
292. A. J. Hoffstaedt, Albion-plain, Blackfriars, and S. Blackwell—Powder flasks and shot belts.
293. G. Briggs, Wigmore-street—Carriage spring.
294. A. V. Newton, 66, Chancery-lane—Spur. (A communication.)
295. A. V. Newton, 66, Chancery-lane—Dry docks. (A communication.)
296. W. Hartfield, Prospect-place, Bermondsey—Book covers in tortoiseshell, and also inlaid with pearl and ivory, &c.
- Dated 8th February, 1855.*
297. J. Wilson, Manchester—Rollers for printing fabrics.
298. A. Girard, Pertuis, Vaucluse—Extinguishing fires.
299. F. Puls, Soho-square—Apparatus for smoking tobacco.
300. J. Armstrong, Normanton—Permanent way.
301. G. F. Wilson and G. Payne, Vauxhall—Glycerine.
302. F. Ransome, Ipswich—Drying articles made of plastic materials.
303. R. J. Maryon, 37, York-road, Lambeth—Ordnance and firearms.
- Dated 9th February, 1855.*
304. C. Armsdell, Fenchurch-street—Sitter.
305. J. Martin, Liverpool—Treating grain.
306. W. B. Adams, 1, Adam-street, Adelphi—Elastic springs.
307. J. Lees and W. Heap, Ashton-under-Lyne—Machine for cutting bars of metal.
308. W. B. Johnson, Manchester—Steam boilers and engines.
309. B. Pont, Paris—Autographic engraving.
310. F. Parker, Northampton—Paper.
311. J. Langman, Plymouth—Portable buildings.
- Dated 10th February, 1855.*
312. C. Barnard and J. Bishop, Norwich—Apparatus for cutting vegetable substances.
314. G. H. Ingall, Throgmorton-street—Telegraph apparatus.
315. S. Russell, Sheffield—Projectiles.
316. G. H. and H. R. Cottam, Old St. Pancras-road—Iron buildings.
317. W. Balk, Ipswich—Machinery for crushing grain.
318. A. Sands, Liverpool—Substitute for clothes-pegs. (A communication.)
319. L. A. F. Besnard, Paris—Fixing lithographs, &c., on canvas.
320. A. E. L. Bellford, 32, Essex-street, Strand—Materials for cementing, painting, &c. (A communication.)
321. G. Rennie, Holland-street—Marine engines.
- Dated 12th February, 1855.*
323. S. Smith, Manchester—Winding yarns.
325. D. Barr, Birmingham—Tap.
327. R. S. Harris, Leicester—Looped fabrics.
- Dated 13th February, 1854.*
329. S. Smith and M. Morris, Manchester—Spinning machinery.
331. A. Vallery, Rouen—Machinery for preparation of flax, hemp, &c.
333. G. Dalton, Lynton—Reverberatory furnaces.
1999. Alfred Wilson and George Wilson, Nottingham—Improvements in knitting machinery.
2041. William Hodson, Kingston-square, Hull—Improvements in apparatus for the manufacture of bricks, tiles, and other articles from plastic materials.
2158. William Johnson, 47, Lincoln's-inn-fields—Improvements in windlasses.
2180. Edward John Seville, Brixton—An improvement in the manufacture of hats.
2442. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Brixton—Improvements in preventing incrustation in steam boilers.
2596. George Taylor, Liverpool—Improvements in regulating the action of governors of steam and other engines.
2624. Samuel Fisher, Birmingham—Improvements in ordnance, and in machinery and apparatus to be employed in manufacturing the same.
2627. Thomas Haimes, Melbourne, near Derby—Improvements in warp machinery.
2630. James Redgate, Sneinton, James Thornton, Nottingham, and Edwin Ellis, Sneinton—Improvements in machinery for the manufacture of lace and other fabrics.
2638. James Rose, Ashford, Kent—An improvement in constructing the fire-boxes of steam boilers.
2663. Robert Von Seckendorf, St. Helens—Improvements in concentrating and distilling sulphuric acid.
2726. John Nash, Market Hasen—Improvements in the means or process of drying malt, grain, or roots.
2730. William Edward Newton, 66, Chancery-lane—Improvements in looms for weaving.
2740. William Ward, Sheffield—Improvements in stoves.
- Sealed February 27th, 1855.*
1893. John Fisher Williams, 19, Artillery-place West, Bunhill-row—Improvements in joining cast-iron tubes.
1914. James Danks, Birmingham—An improvement or improvements in instands, which improvement or improvements may also be applied to the stoppers of bottles, the packing of pistons, and other like purposes.
1919. Henry Bernoulli Barlow, Manchester—Improvements in machinery for cleaning cotton and other fibrous materials.
1920. Nicholas Callan, Maynooth College—Improvements in certain galvanic batteries.
1930. William Hill, Congleton—Improvements in doubling or twisting net or raw silks.
1936. Jacques François Henry Hypolite Hervé de Lavaur, Paris—Improvements in securing waterproof wrappers or coverings used in packing goods.
1940. Samuel Stocker, Brighton—Coverings for various parts of the human body with a view to the preservation of health.
1958. John Jones, Sheffield—Improvements in metal dinner and dessert forks.
1982. Martin Billing, Birmingham—Improvements in manufacturing and ornamenting castors for furniture.
2008. Andrew Barclay, Kilmarnock—Improvements in refracting and reflecting telescopes.
2440. John Macadam, M.D., Glasgow—Improvements in the preparation or sizing of paper or the materials used in the manufacture thereof.
2525. Joseph Whitworth, Manchester—Improvements in cannons, guns, and fire-arms.
2595. Joseph Alfred Nicholson, 10, Chapel-place, Bermondsey—Improvement in the manufacture of dinner and dessert or table forks.
2686. Richard Whytock, Edinburgh, and Thomas Preston, Nottingham—Improvement in the manufacture of fabrics by twist lace machinery.
2702. John Hunt, Birmingham—Improvements in illumination.
2736. John Cockcroft, New Acerrington—Improvements in machinery or apparatus for printing woven or textile fabrics and yarns.
2739. James Murdoch, 7, Staple-inn—Improvements in waterproofing woven fabrics.

EXTENSIONS SEALED.

23rd February, 1855.

8. George Lowe, Finsbury-circus—Improved methods of supplying gas under certain circumstances, and of improving its purity and illuminating powers.—Five years from 17th March, 1855.
9. Edward Foard, 39, Nicholas-street, Hoxton—An improved method or improved methods of supplying fuel to the fire-places or grates of steam-engine boilers, brewers' coppers, and other furnaces, as well as also to the fire-places employed for domestic purposes, and generally to the supplying of fuel to furnaces or fire-places in such a manner as to consume the smoke generally produced in such furnaces or fire-places.—Six years from 17th January, 1855.

WEEKLY LIST OF PATENTS SEALED.

Sealed February 23rd, 1855.

1883. George Burch, Waltham-cross, Cheshunt—Improvements in the manufacture of pulp.
1886. James Lamb Hancock, Milford Haven, Pembrokeshire—Improvements in machinery for draining land.
1889. Thomas McNally, William-street, Bridge-street, Blackfriars—Improvements applicable to window sashes or shutters.
1927. James Parker, Birmingham—An improvement or improvements in the smoke boxes of locomotive engines.
1966. Julian Bernard, Club-chambers, Regent-street—Improvements in the manufacture of boots and shoes or other coverings for the feet.
1974. Thomas Clowes, Beverley—Improvements in muzzles for horses, or apparatus to prevent horses from biting or sucking their cribs or mangers.
1980. Samuel Szontagh, Paris—Improvements in sewing machines.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3685	Feb. 20.	Price's Cooking Stove Lamp	Price's Patent Candle Co....	Belmont, Vauxhall.
3686	" 21.	Handle and Socket for Carriage Lamp ...	Oakes and Ward	Birmingham.
3687	" 22.	Cake Mill Frame	Smith and Ashby	Stamford.
3688	" 23.	Price's Cooking Stove Lamp	Price's Patent Candle Co....	Belmont, Vauxhall.
3689	" 26.	Penholder.....	Hinks and Wells.....	Birmingham.